

*Comparison of Mean Results with Tabular Right Ascensions.*

Name of Star.	Mean of R.A. from Radcliffe Observations reduced to 1887.			Tabular R.A. from the <i>Nautical Almanac</i> for 1887.			Tabular R.A. from Greenwich Clock star list for 1887.			Tabular R.A. from <i>Bey-</i> <i>liner Jahrbuch</i> for 1887.		
	h	m	s	h	m	s	h	m	s	h	m	s
Polaris	1	17	21.60	1	17	19.63	1	17	20.00	1	17	21.73
Cephei 51 (Hev.)	6	47	16.48	6	47	16.60	6	47	16.57	6	47	16.96
δ Ursæ Minoris	18	8	45.86	18	8	46.00	18	8	46.00	18	8	45.98
λ Ursæ Minoris	19	36	47.82	19	36	46.88	19	36	47.72	19	36	48.00

*Radcliffe Observatory, Oxford :*  
1887, January 13.

*Note on the Application of Photography to the Determination of Stellar Parallax.* By the Rev. Prof. Pritchard, D.D., F.R.S.

At the meeting of the Society in June last, I communicated the results of some preliminary trials with the view of ascertaining the applicability of photography to astronomical measurements of sufficient delicacy for the accurate determination of stellar parallax.

These results proving eminently satisfactory, the requisite operations for the determination of parallax commenced on May 26 of last year by taking photographs of the district round 61<sup>1</sup> and 61<sup>2</sup> *Cygni*, which star was selected on account of the unusually numerous examinations which had been applied to it by successive astronomers from the time of Bessel (1840) to the present date; my object being not so much to effect a re-determination of the parallax of this historical star as to obtain the means of comparing the photographic method with those other methods of micrometrical measurement heretofore directly applied to this end.

For the purpose in view, four faint stars, viz. :

- D.M. + 37 No. 4189 . . . . (a)
- D.M. + 38 „ 4336 . . . . (b)
- D.M. + 37 „ 4175 . . . . (c)
- D.M. + 38 „ 4348 . . . . (d)

were selected from others whose images were impressed on the photographic plates. The distances of each of these four stars (eight in all) were carefully measured from each of the two components of 61 *Cygni*, on plates taken on fifty nights, ending on Dec. 7, 1886. In general, four plates were exposed each night, so that some 200 plates have been measured in the course

of the investigation. All these measures were strictly independent of each other, as were also the ultimate reductions. The astronomical importance and novelty of the inquiry seem to me to justify all this expenditure of time and labour.

In order to meet the ever-varying conditions of the instrument in respect of focus, and other contingent elements, the above measures were not reduced in terms of the registered scale of the macro-micrometer; but they were always referred to the presumably constant distance of the star (*a*) from the star (*b*), or of (*c*) from (*d*). These fundamental distances were always measured at the same time as were the other eight.

The proper motion of 61 *Cygni* has been so exactly determined that its effects could be definitively removed from the measured distances, and a temporary solution of the equations on this hypothesis appeared to be desirable and legitimate. The results of this preliminary solution are given as follows:—

Star's Designation.	Parallax of 61 <sup>1</sup> Cygni.	Probable Error.	Parallax of 61 <sup>2</sup> Cygni.	Probable Error.
<i>a</i> D.M. + 37 No. 4189	0.4412	0.0154	0.4204	0.0229
<i>b</i> D.M. + 38 „ 4336	.4529	.0330	.4139	.0185
<i>c</i> D.M. + 37 „ 4175	.4433	.0197	.4721	.0215
<i>d</i> D.M. + 38 „ 4348	.4158	.0161	.4574	.0252

The provisional *means* for parallaxes thus obtained for the four independent sets of measures of 61<sup>1</sup> and 61<sup>2</sup> *Cygni* respectively are as follows:—

$$\begin{aligned} \text{For 61}^1 \text{ Cygni . . . . Parallax} &= .438 \\ \text{61}^2 \text{ Cygni . . . . Parallax} &= 0.441 \end{aligned}$$

Values of the parallax of 61 *Cygni* have been determined by several astronomers; among them are found

$$\begin{aligned} &\text{Bessel } 0.348 \text{ in } 1840 \\ &\text{Auwers } 0.564 \text{ in } 1863 \\ &\text{Ball } 0.468 \text{ in } 1878 \\ &\text{Asaph Hall } 0.261 \text{ in } 1880 \end{aligned}$$

The Oxford determination is to be regarded as provisional only; the research will be continued to the end of the annual cycle, and full details will be communicated at the earliest opportunity.

In the communication made to the Society in June last reference was made to the liability of the photographic film to be occasionally dislocated. The possibility of such an occurrence renders it advisable in all cases where reliable accuracy is sought to take photographs in duplicate at least. One of the causes of this liability has been traced to its origin in the mechanical

action of the *impact* of water on the film; which *impact* has been regarded as essential to the proper washing of the plate. I find that in the entire series of about 200 plates, seven have exhibited minute but noticeable traces of this dislocation; these have been rejected in the above investigation.

*University Observatory, Oxford:*  
Jan. 13, 1887.

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*Photographs of Nebulæ in Orion and in the Pleiades.*  
By Isaac Roberts.

The accompanying photograph of nebulæ in *Orion* is enlarged five times from a negative which I took on November 30 last, between 4<sup>h</sup> 13<sup>m</sup> and 5<sup>h</sup> 20<sup>m</sup> sidereal time at Maghull. The exposure was intended to extend to two hours, but an accident stopped it after 1<sup>h</sup> 7<sup>m</sup>, and clouds have prevented another photograph being taken since that date.

The photographic extensions of the nebulæ may be judged by comparing this photograph with that taken by Mr. Common, and referring to the included and surrounding stars in them respectively, as places from which to measure.

It will thus be seen that the dark space shown on Mr. Common's photograph between the small nebula (Herschel, No. 1185) and the Great Nebula, as well as the "fish mouth," are filled with dense nebulous matter, which also can clearly be traced between Declination  $-5^{\circ} 15'$  and  $-6^{\circ} 15'$ . In Right Ascension it can be traced between 5<sup>h</sup> 26<sup>m</sup> and 5<sup>h</sup> 29<sup>m</sup>—an area about seven times that covered by Mr. Common's photograph.

There is a large, dense, and characteristically marked nebula to the north (Herschel, No. 1180), and the photograph indicates very faint nebulosity stretching some distance between this and the Great Nebula, but hitherto, owing to continuous bad weather, there has been no opportunity for proving by a long exposure of plates that this nebula also forms a part of the Great Nebula. If this should be proved, and there is now reasonable ground for inference, then extensions of the nebula will be revealed to us on a scale still more vast than has hitherto been known.

In the accompanying print the central parts of the nebulæ are white, without any shading, but on the negatives, when they are examined by the eye or under a microscope, those parts are full of detail, and delicate, but dense, cloud-like, curdling masses. I hope that, some time before the close of this session, I may have clear sky to enable me to present to the Society photographic analyses of this nebula, which will show the appearances presented by it with different lengths of exposure.

This method will give a more accurate insight into its constitution, and will furnish more reliable means for detecting any